VLE Beam - initial MC comparisons

- MDMC (Milind's MC) flux
- VLE and LE geometries
- GNUMI modifications
- Comparison between GNUMI VLE and MDMC VLE

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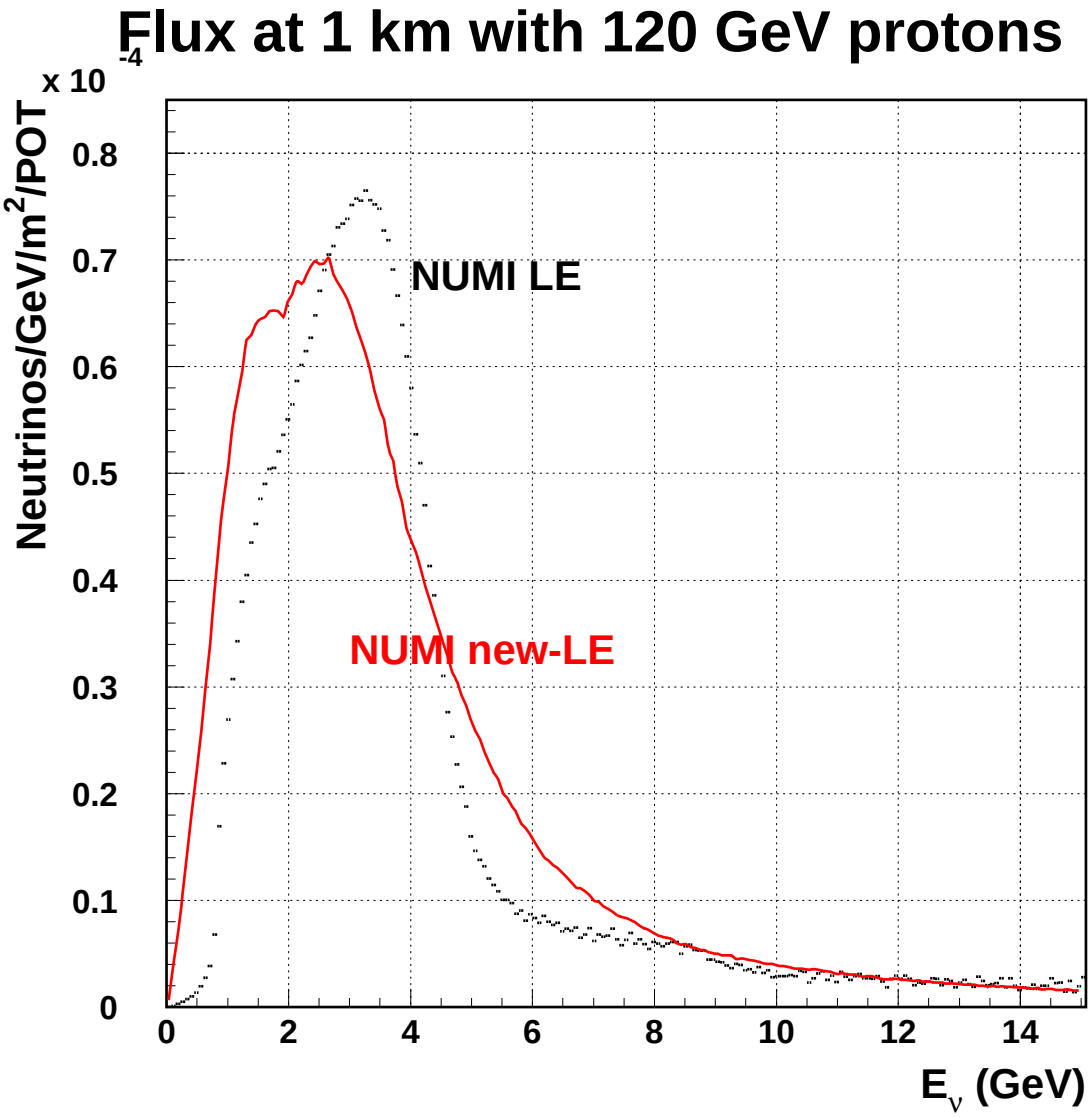
MD MC Flux



- Boost low energy side to put flux where the oscillation is expected.
- Keep high side low to reduce NC background feed-down.
- Protect against best fit Δm^2 going any lower

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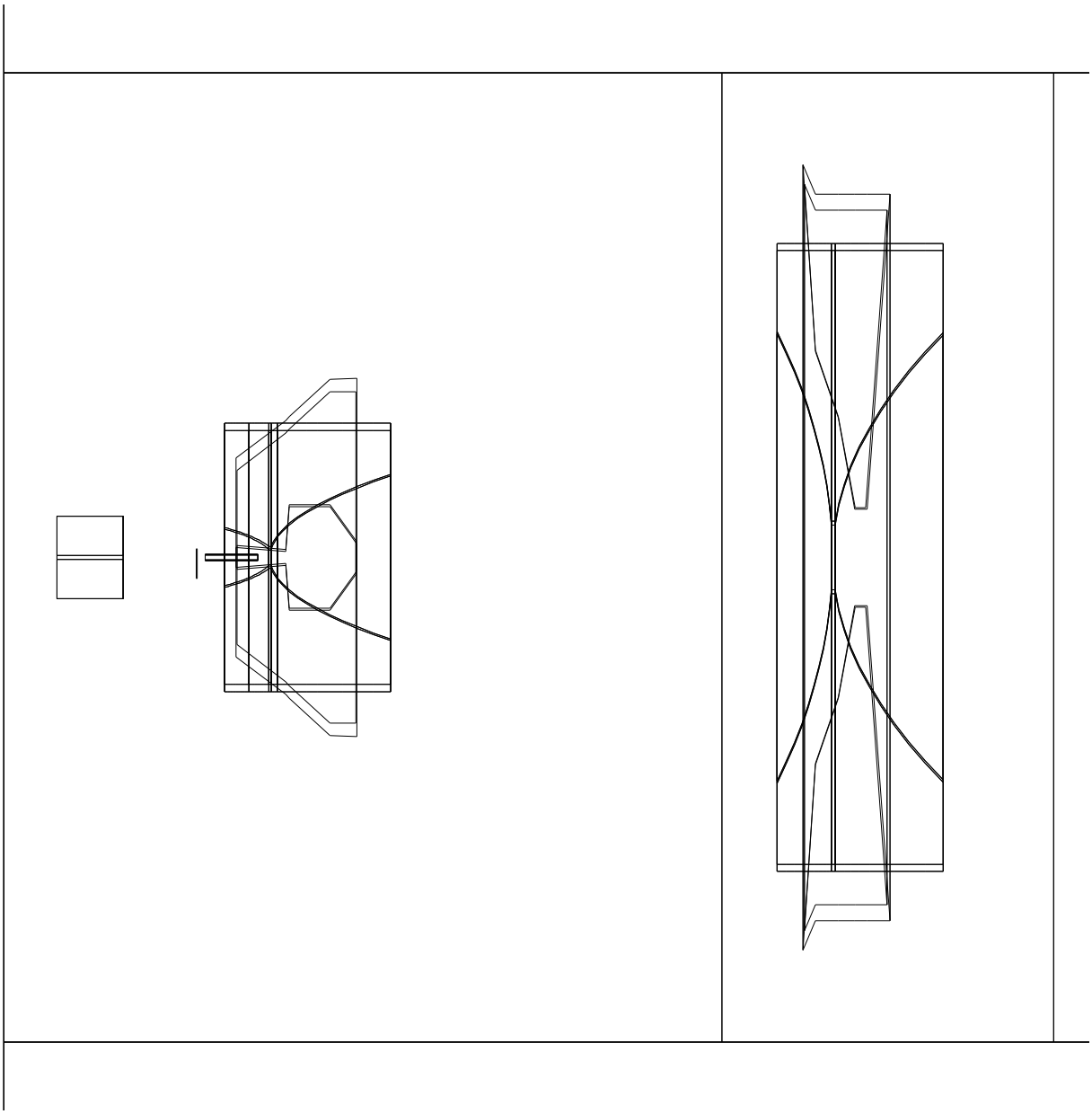
VLE/LE horn overlay



- MDMC target not shown
- MDMC Horn 1 has non cylindrical outer conductor, not supported in GNUMI →

"Chorn": New horn type in GNUMI

Want to check MDMC codes with GNUMI but no support for necessary shape. $\longrightarrow$ Chorns

- Works around some limitations of the standard "Phorn" based objects.
- Embedded, arbitrary, independent poly-cone shapes for air-metal and metal-cavity boundaries.
- Allows for non-cylindrical outer conductor.
- Simple 1/r B-field (assumes zero skin depth).
- Not yet in CVS, but will be soon.
- Probably not useful outside of special studies.

Changes from standard LE parameters

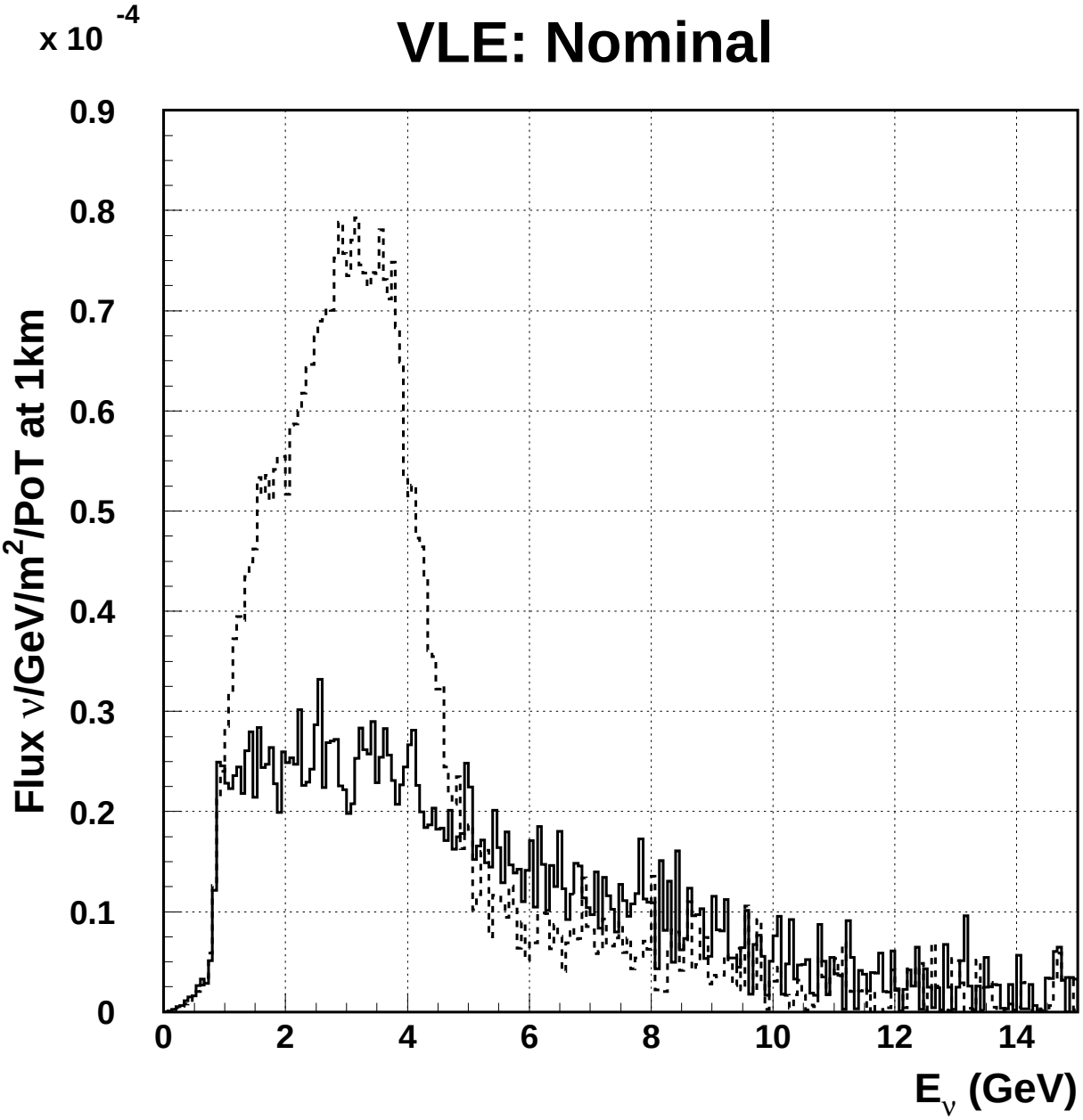
Besides the new Horn 1, these changes from LE:

- Proton beam: circular 1.5mm (1 σ)
- Target: 6.0 mm radius, 60 cm length cylinder. Starts at face of horn one, fully enclosed.

Rest stays the same, in particular:

- Same target and horn materials
- Location of Horn 1 essentially unchanged
- Horn 2 unchanged in shape and location

Nominal VLE Flux



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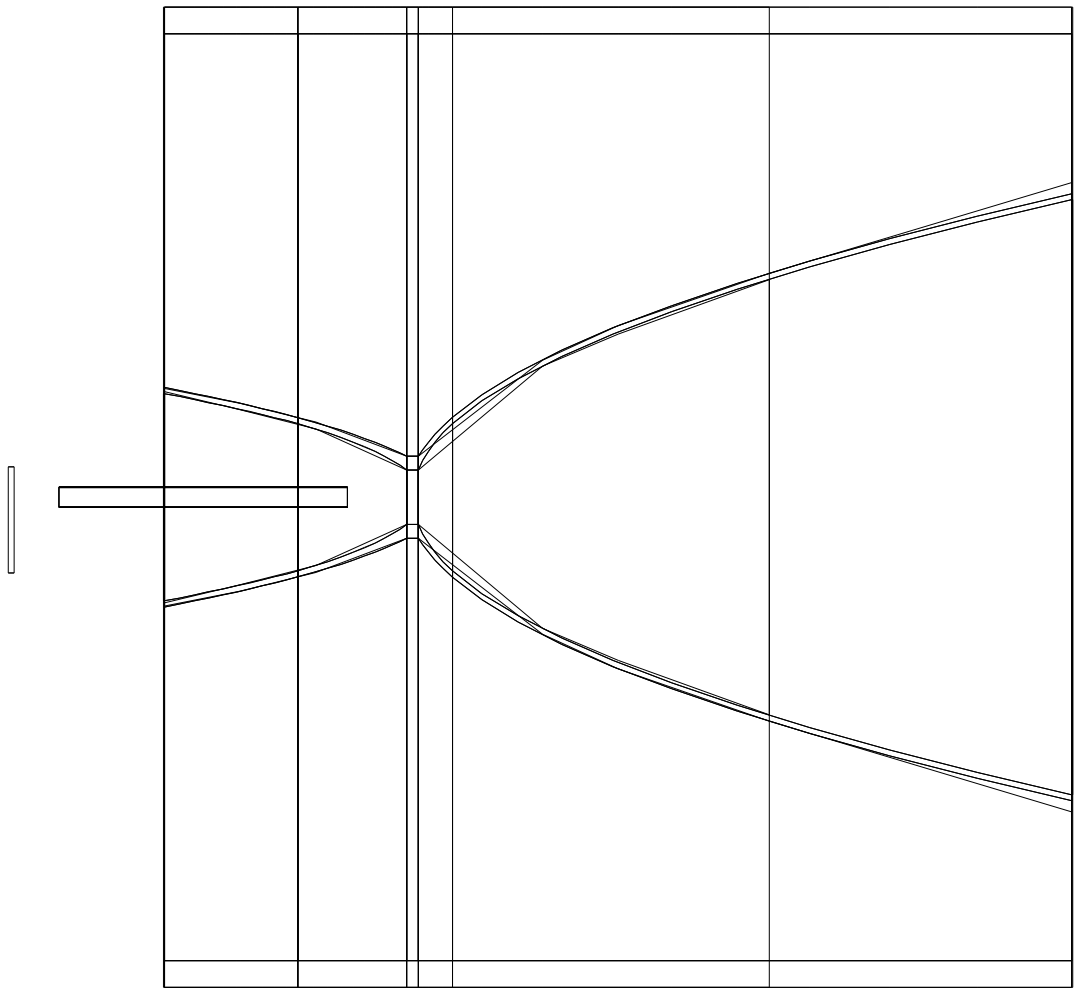
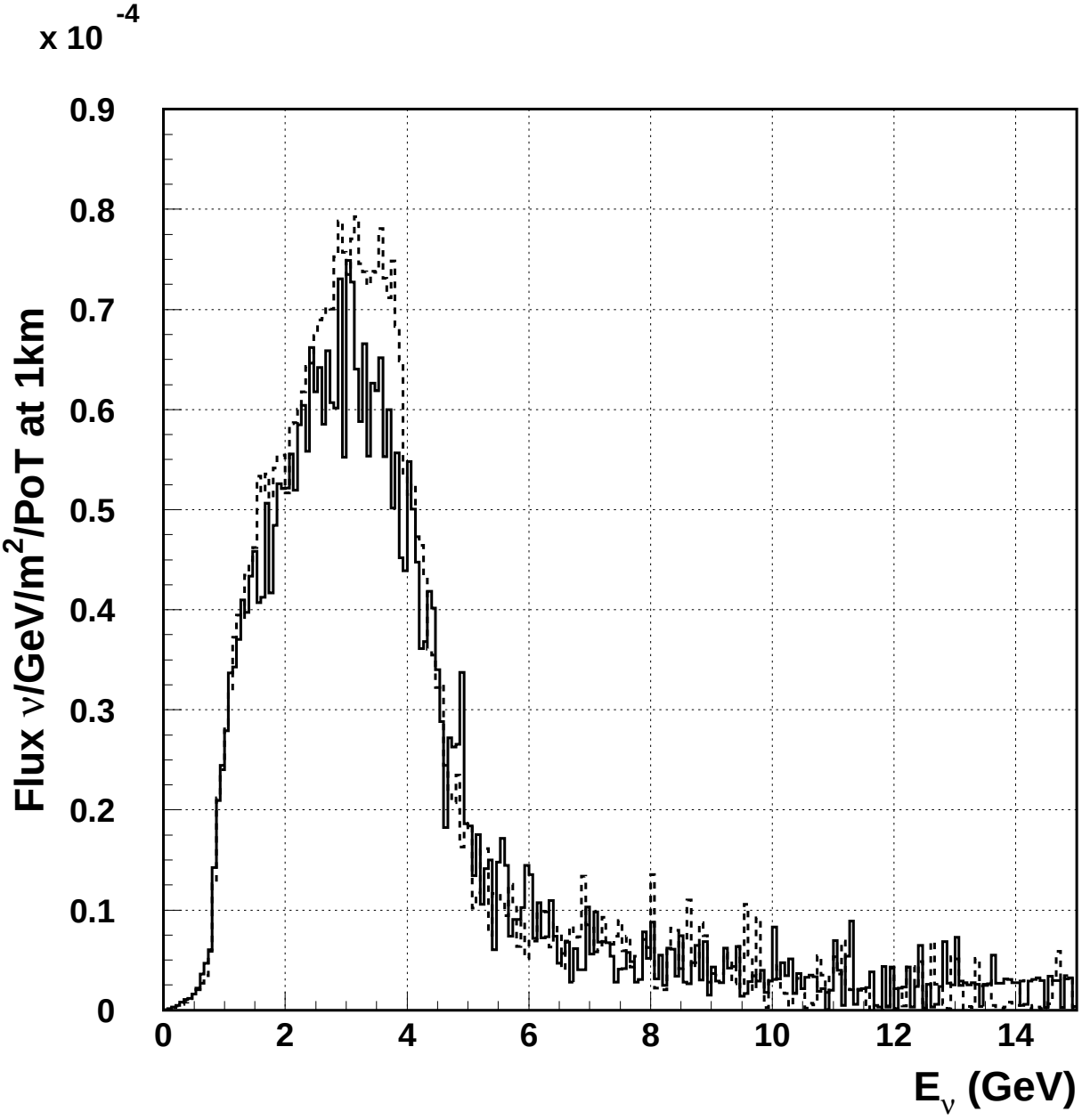
LE Horn 1, roughed with Chorns



LE Phorn and approximate LE Chorn overlayed.

(MDMC target not shown)

LE Flux, implemented with Chorns



Approximate reproduction of LE Phorn flux with LE Chorn. Adding more Chorn segments brings it arbitrarily close.

→ don't think Chorn implementation has bugs

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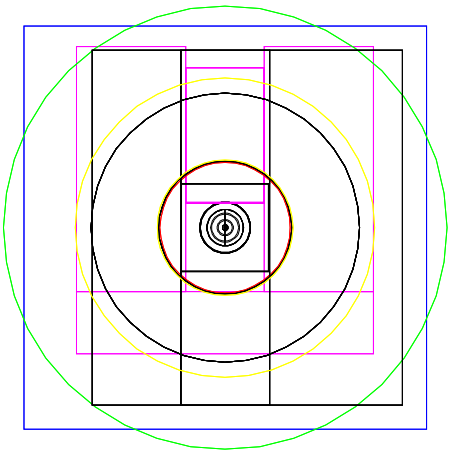
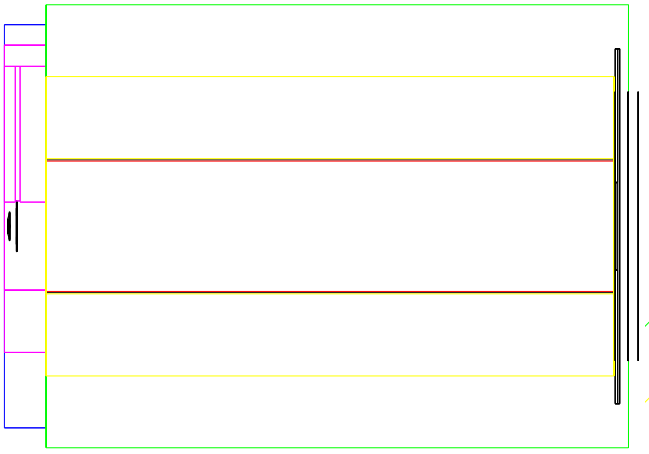
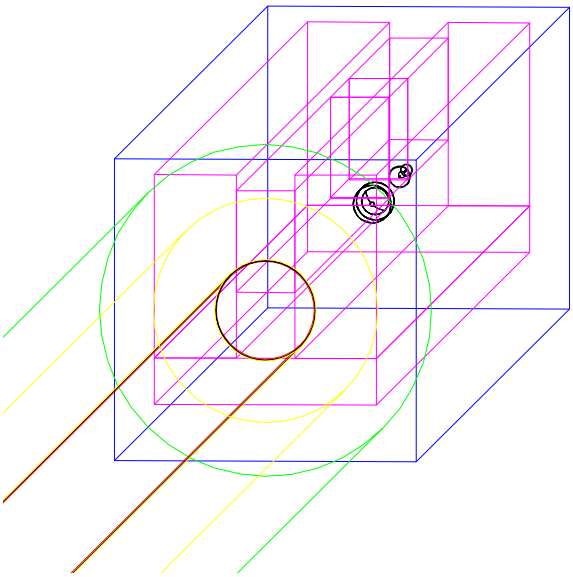
Nominal VLE geometry







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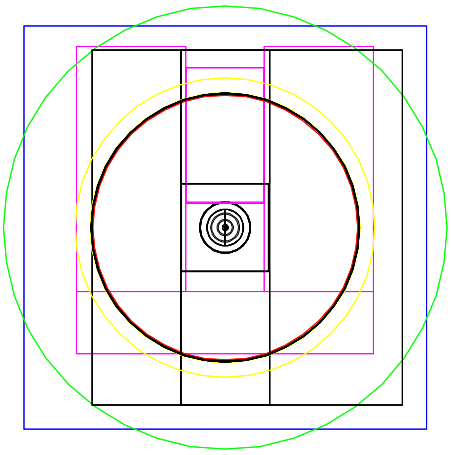
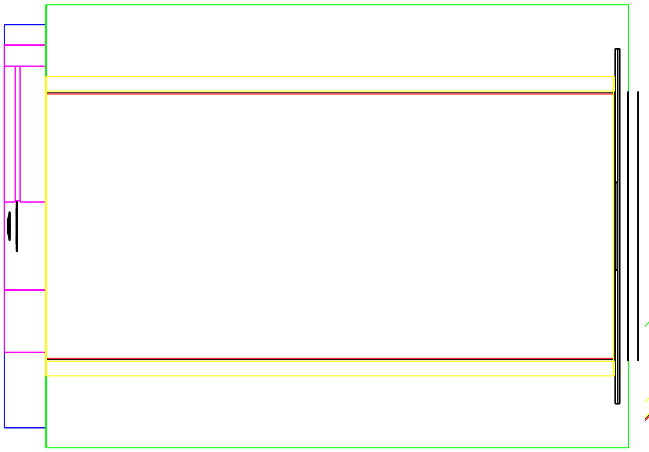
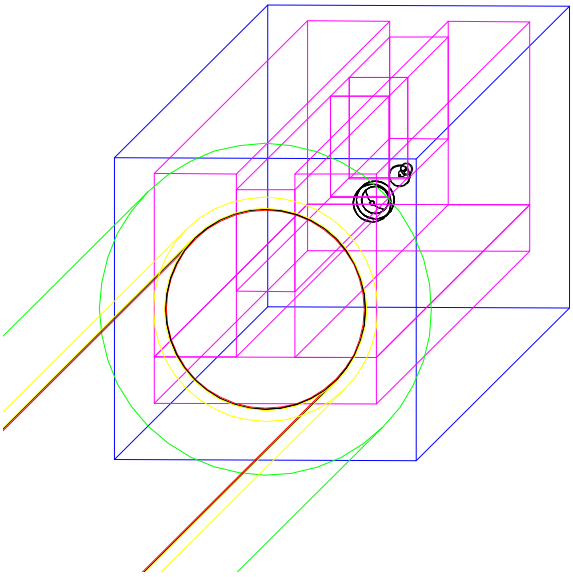
A more open geometry?

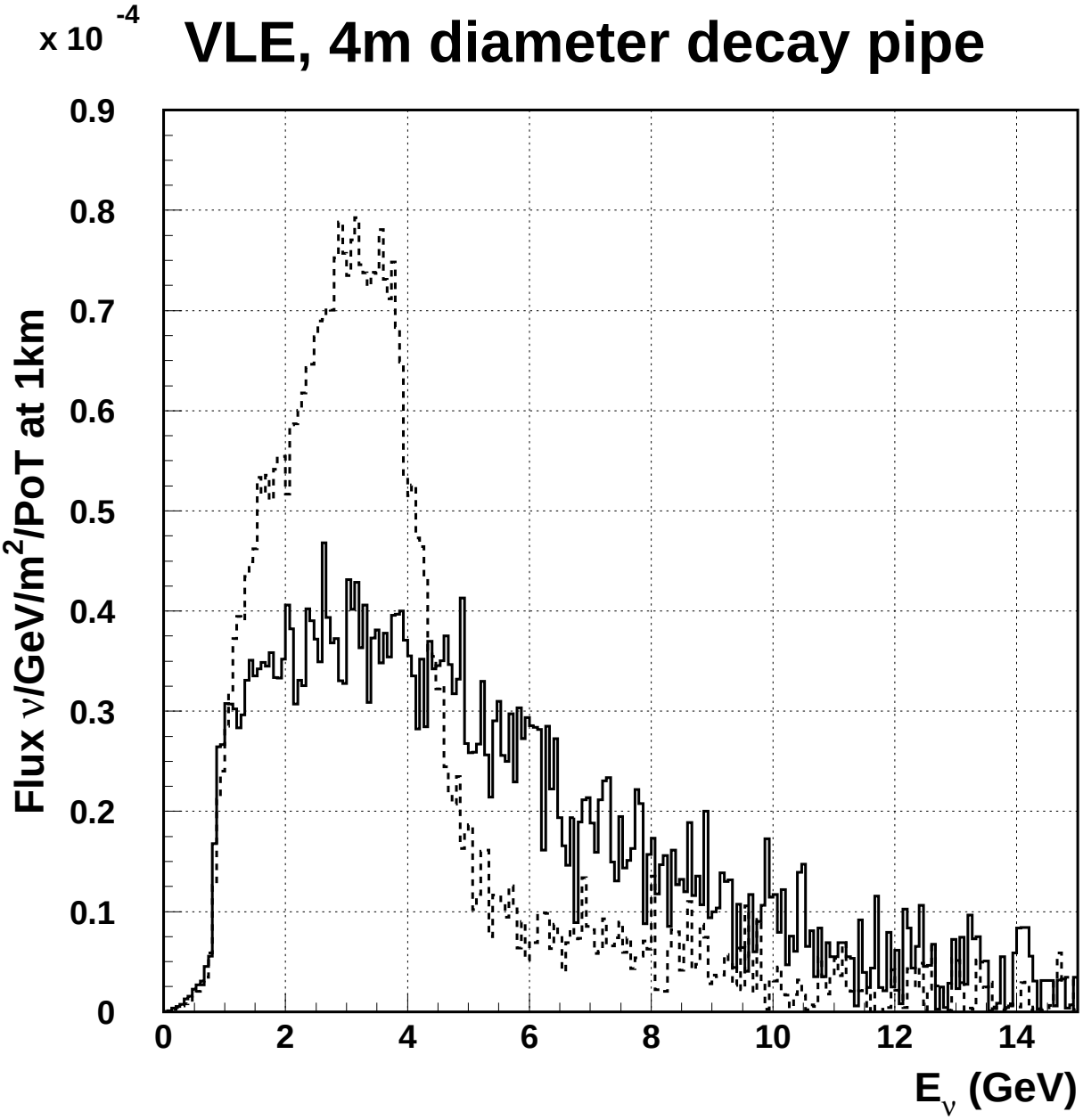
MDMC's geometry is more open. In particular it uses a 4m radius decay tunnel:







A more open geometry?



Closer...

But, still no excess in 1-2 GeV, and tail getting high.

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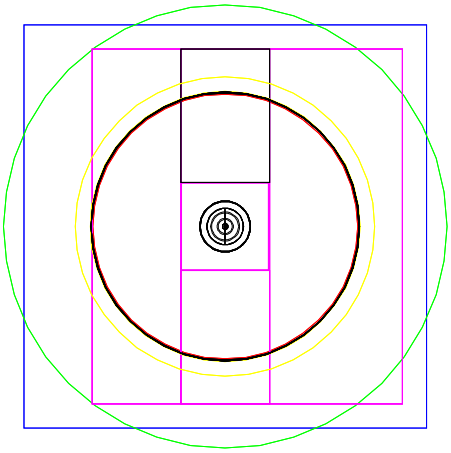
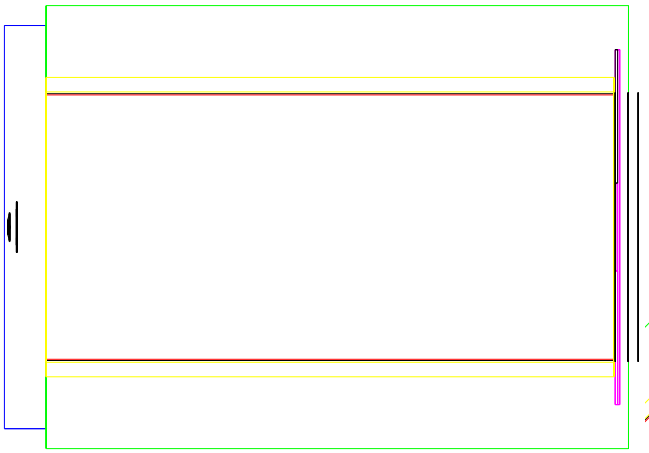
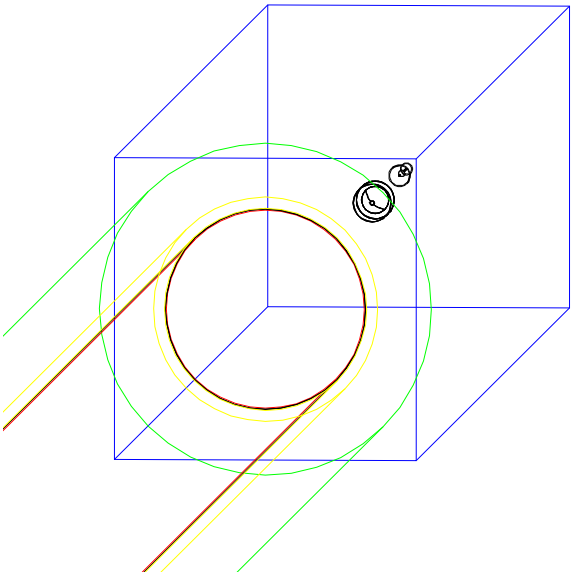
Radiation is good for you

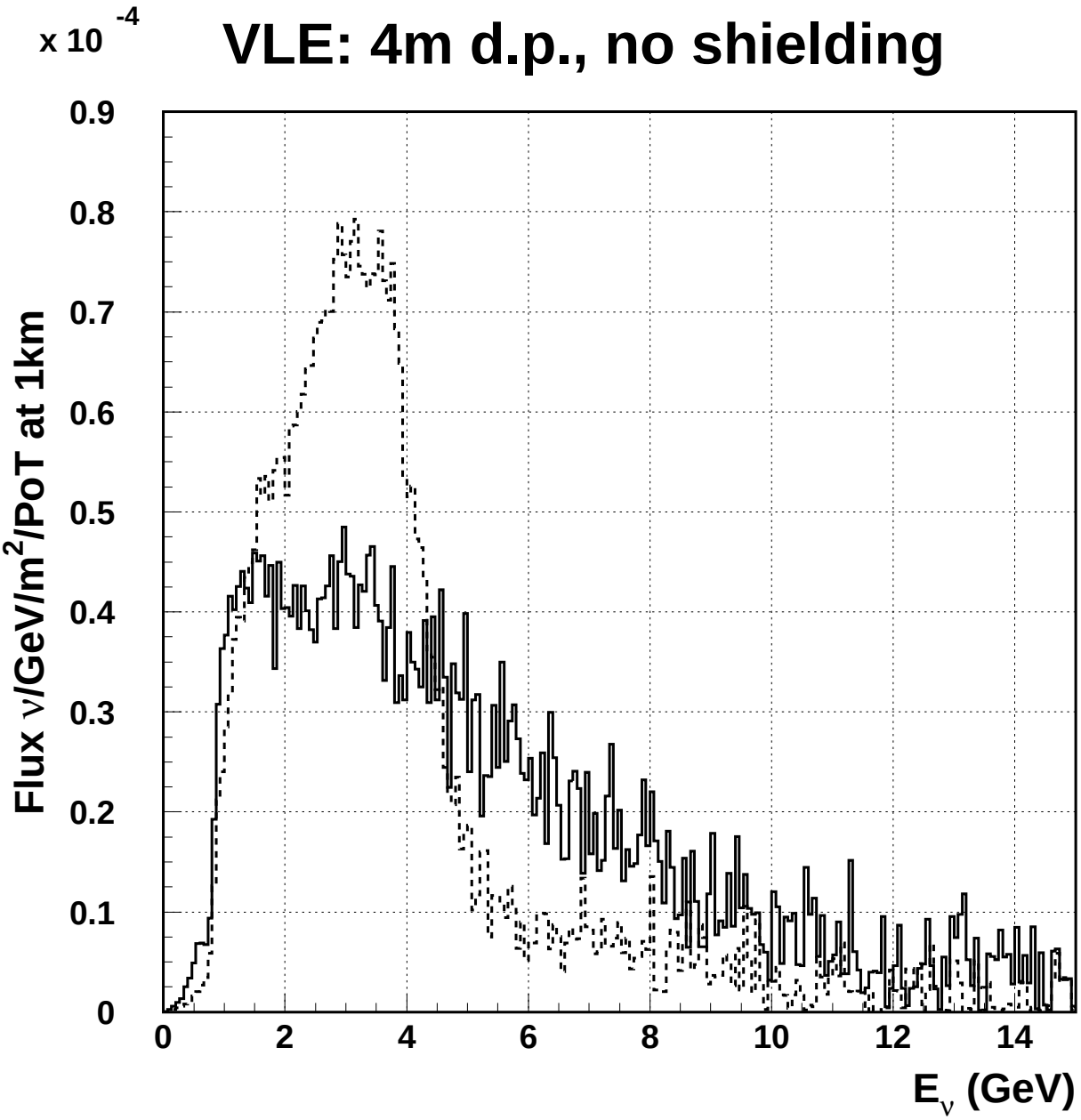
Remove target area shielding







No target shielding, wide decay tunnel



Still no real low energy enhancement.

Tail marginally higher.

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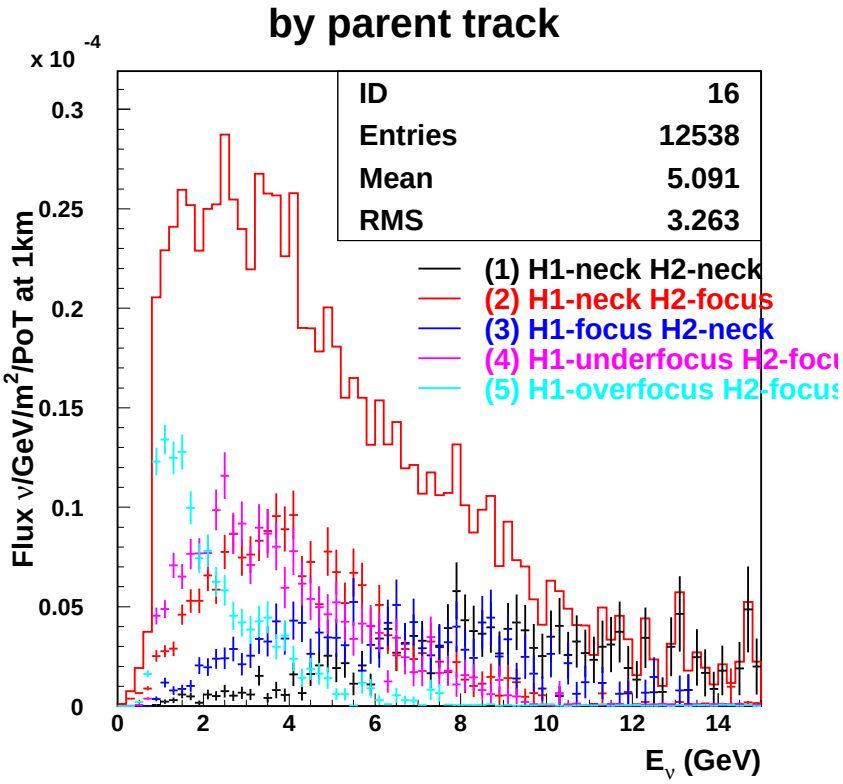
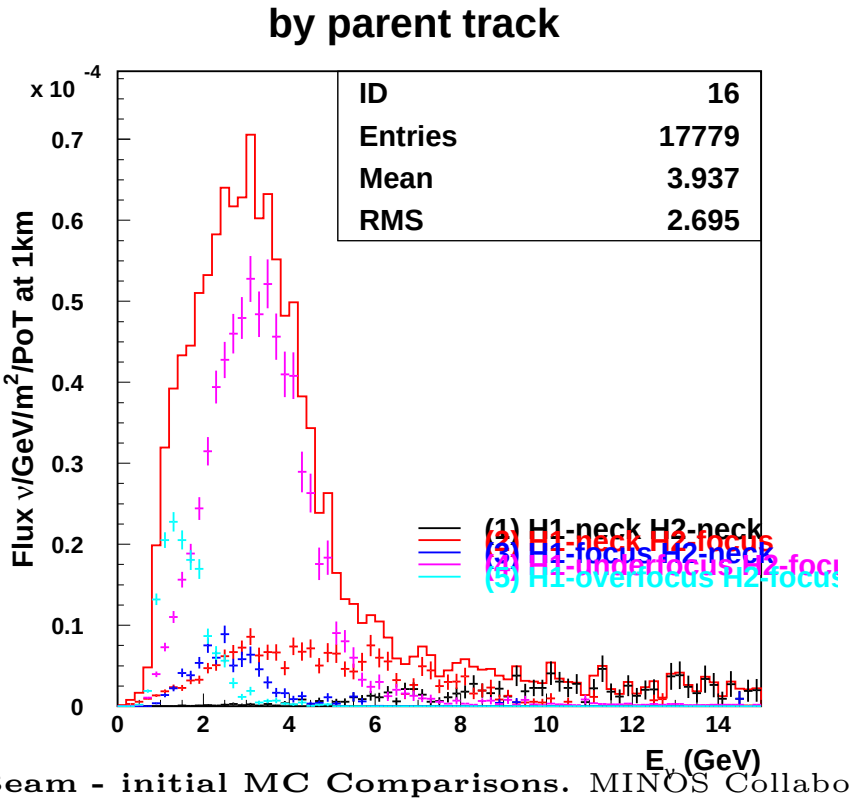
Pion trajectory classes





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Start looking in more detail

Pion production comparison, π^+ leaving target

- GNUMI: 5.2 pions/proton
- MDMC: 6.3 pions/proton

$\sim$20%, in the right direction but not enough to explain the remaining discrepancy.

Will continue comparing details with MDMC and GNUMI

- Checking geometry more closely
- Flux just after Horn 2
- Tracing specific pions
- ...